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Turfgrasses of Kentucky

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Gregg Munshaw, Plant and Soil Sciences

Roughly 7,500 grass species are grown around the world, but only 14 species are adapted as turfgrasses that have been used extensively. Kentucky is situated in the transitional climatic zone of the United States, the middle point between the cool north and the warm south, with warm summers and cool winters. Because of its unusual climate, no single grass is suitable for all situations and locations.

The majority of the turfgrasses that are appropriate for use in Kentucky are known as C3 grasses, or cool-season grasses. Cool-season grasses differ from warm-season grasses (C4) in many ways, but most notably in their photosynthetic pathways. Warm-season grasses can tolerate and even thrive during the warm summers while cool-season grasses may become heat-stressed. Conversely, winters in Kentucky may be too cool for warm-season grasses and greenup in the spring may be long and arduous. Warm-season grasses enter a dormancy period during the fall and winter and may stay in this state as long as six or seven months.

The Grass Plant

Recognizing a grass plant from other kinds of plants is easy, but to identify the type of grass we must look very closely at the plant to see the characteristics that are specific to a particular species (Figure 1).

The **seedhead** can be very useful for identifying turf species. However, we cannot rely solely on the seedhead for identification of grasses because the most common maintenance practice on turf—mowing—removes seedheads. Some grasses will replace seedheads or regrow very quickly after mowing and the seedhead is very useful for identifying these species. The types of seedheads include raceme, panicle, and spike (Figure 1).

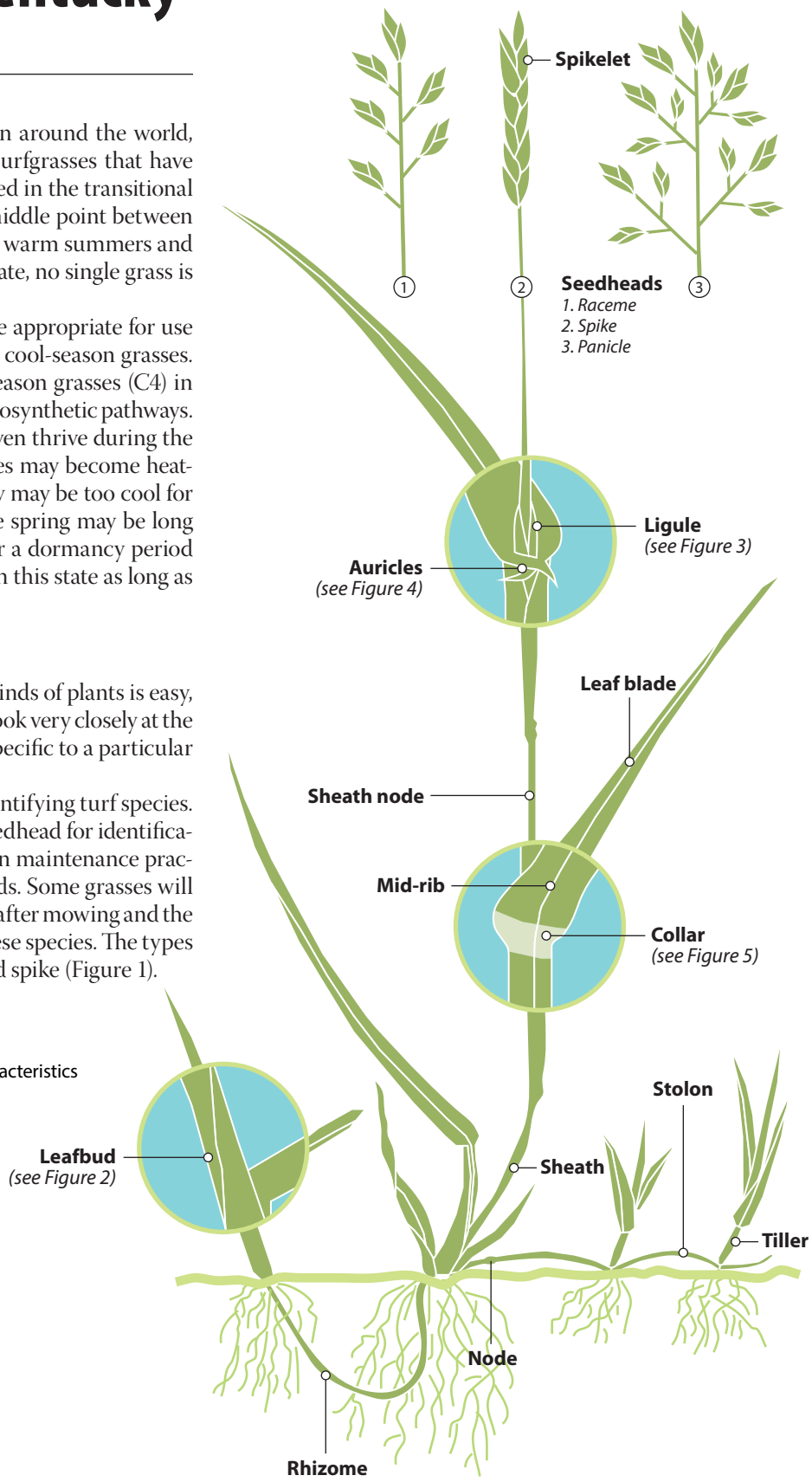


Figure 1. The common grass characteristics used in identification.

Vernation, the arrangement of leaves within a bud, is another characteristic used for identification of grasses (Figure 2). Grass plants produce new leaves inside of existing leaves. If you look closely at a shoot, you will see a new leaf emerging from the middle. While the leaf is in this juvenile stage, it will be either rolled or folded, depending on the species. Although the vernation can be difficult to see, determining it will help narrow down the number of possible species.

One of the most helpful identifying characteristics of most grass plants is called the **ligule** (Figure 3). A mature leaf has two main parts: the leaf blade and the sheath. The sheath is wrapped around the stem of the plant, and the leaf blade extends away from the plant. To find the ligule, look at a mature leaf that is extended to the side of the plant. Pull this mature leaf away from the main stem and examine the area where the leaf folds away from the stem. You may see some small hairs or a membrane that may be fingernail shaped. On some grasses one must look very closely for the ligule because it can be very small; on other grasses the ligule is absent or nearly absent.

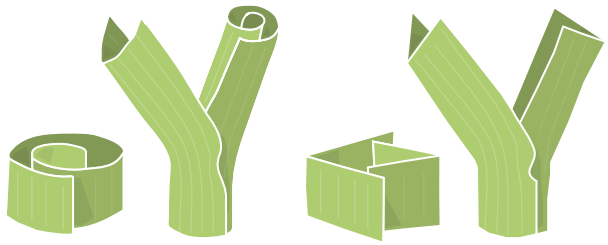
The **auricles** protrude away from the top of the sheath and can wrap around the stem in certain species (Figure 4). Many grass species have very short auricles or they do not have them at all, making this a characteristic less commonly used in identification of turfgrasses.

The **leaf blade** itself can be used for identification. Some leaves have a prominent mid-vein, some are nearly smooth, and others very veiny. Hairs may be found on leaves of some species, and some may have a serrated edge. Although the leaf blade should not be used exclusively for identification, it can be helpful in identifying some species.

The **collar** is located opposite the ligule on the back side of the leaf where the sheath and the leaf blade meet (Figure 5). The collar region is typically a lighter shade of green than the sheath or the blade, and it can either be continuous, divided, or broad.

At the base of the grass plant lateral stems known as **stolons** or **rhizomes** may be found (Figure 6). Stolons (also known as runners) are aboveground stems that encourage turf density and aide in recovery after damage. They can also be a nuisance by spreading into areas where they are unwanted. Rhizomes grow underground and are important for food storage, among other things. Some species have stolons and rhizomes, others stolons or rhizomes only, and still others have neither. Bunch-type grasses expand only by tillering, which is the production of new shoots from the original shoot. The presence of stolons and/

Figure 2. The new leaf emerging from the center of the plant is known as the leaf bud or **vernation.** This new leaf will be either rolled or folded. The vernation in the lower image is rolled.



leafbuds rolled in the bud *leafbuds folded in the bud*

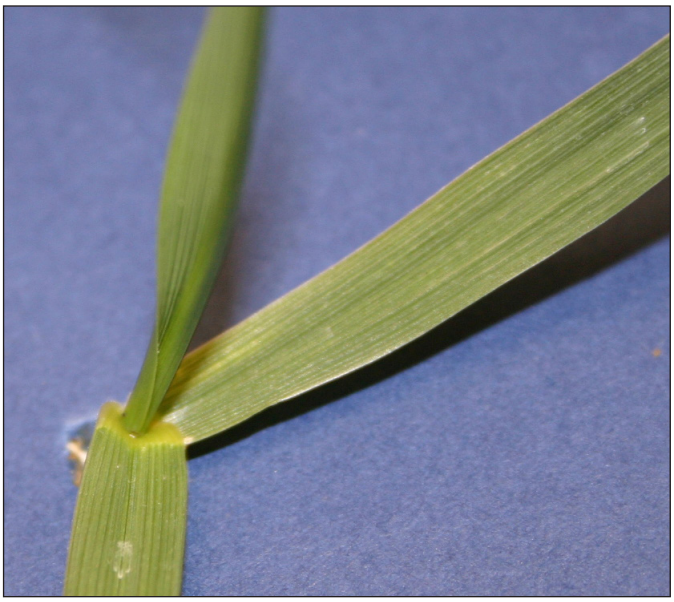


Figure 3. Ligules are located at the intersection of where the mature leaf folds away from the stem. Ligules may be membranous, hairy, or absent.

membranous ligule *hairy ligule* *no ligule*

Figure 4. The tiny appendages that clasp around the stem are **auricles.**

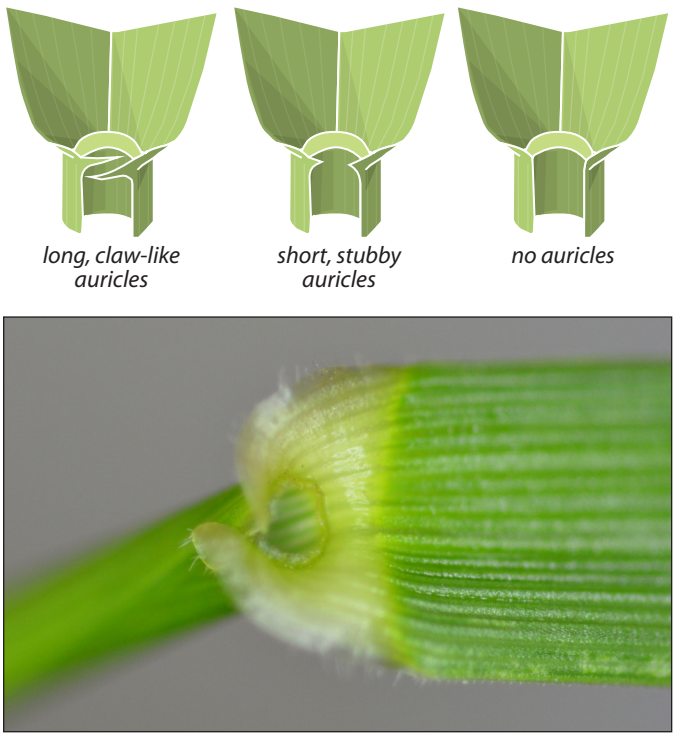
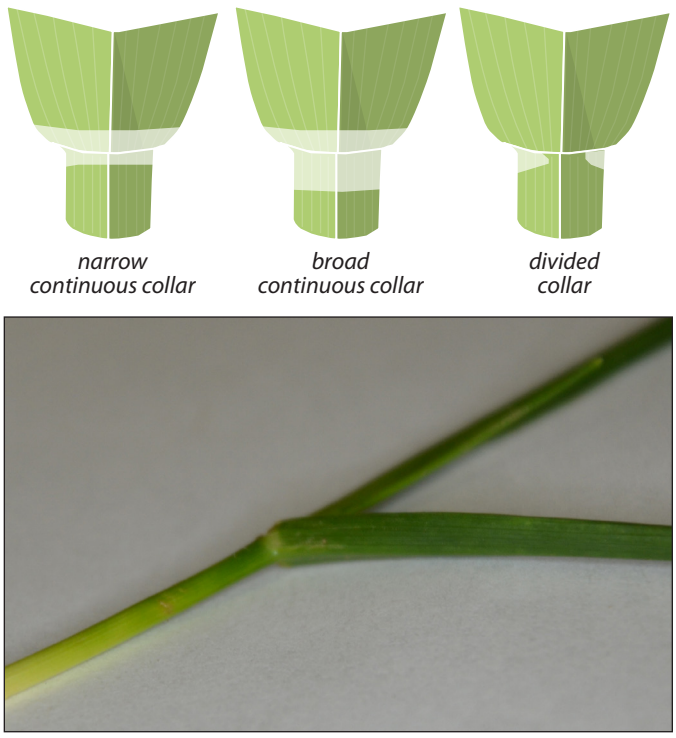


Figure 5. Collars are found on the back side of the leaf and typically have a lighter green color than the rest of the leaf.



or rhizomes can be a great identifying characteristic of turfgrasses.

Nodes are found on stolons or rhizomes. A node is an area that can produce a new stem or plant. Nodes are easy to detect as they are larger than the rest of the stolon/rhizome. Roots and shoots may be found growing from nodes on stolons. The growth habit of grasses may be stoloniferous, rhizomatous, both stoloniferous and rhizomatous, or bunch-type (Figure 1).

The following section will describe some of the strengths and weaknesses of the most common turfgrasses grown in Kentucky and will serve as a guide to help with identification. For recommended cultivars of the following turfgrasses, visit http://www.uky.edu/Ag/ukturf.

Figure 6. Lateral stems are important for recovery after wear but are also an excellent identification characteristic. Note the roots and tillers at each node of the rhizome.

Cool-Season Grasses

Tall Fescue

Festuca arundinacea Schreb.

Tall fescue is an excellent choice for home lawns as well as utility areas and golf courses across Kentucky (Figure 7). It has a deep root system that allows excellent heat and drought tolerances compared to other cool-season grasses. Although it may go dormant during very warm and dry summers when no irrigation is provided, it will typically reappear during the fall when conditions become more favorable.

Tall fescue will tolerate moderate amounts of shade. It should be maintained at no lower than 1.5 inches. It has a medium coarse texture, and cultivars are typically a dark green color. Tall fescue will usually display a purplish-red color at the base of the stem, and the edges of leaves will feel like a serrated knife when rubbed against the skin. It is considered a bunch-type grass, which means it will not spread into flower beds, but it also does not recover from traffic very well. Because of traffic and mowing height limitations, its success on athletic fields has been limited. Tall fescue is available as sod or seed and may be mixed with other cool-season grasses.

Tall Fescue	
Seedhead:	loosely branched panicle that somewhat resembles the shape of a pine tree (Figure 8)
Vernation:	rolled (Figure 9)
Ligule:	very short membrane, difficult to distinguish
Auricles:	very short
Leaf blade:	very veiny (Figure 10)
Collar:	broad and divided
Growth habit:	bunch-type with occasional very short rhizomes (Figure 11)

Figure 7. The dark green and upright growth habit of a tall fescue lawn.

Figure 9. A cross-section through the tall fescue leaf bud showing a rolled vernation. Also note prominent hairs on the margin of the collar.

Figure 10. The veiny leaf surface of tall fescue.

Figure 8. The loosely branched panicle of a tall fescue seedhead.

Figure 11. The bunch-type growth habit of tall fescue (no stolons and no, or very few, rhizomes).

Kentucky Bluegrass

Poa pratensis L.

Kentucky bluegrass is frequently used as a turfgrass in Kentucky (Figure 12), although it does not possess the heat tolerance of tall fescue and can struggle during the summer if irrigation is not provided. When Kentucky bluegrass becomes heat- and drought-stressed during the summer, its survival mechanism is to shut down into a dormant state until conditions improve, making it strongly resemble a dead lawn.

Kentucky bluegrass is a full-sun turfgrass so will not tolerate any shade. It is primarily used on lawns and athletic fields in Kentucky. Its traffic tolerance is poor, but it recovers well due to aggressive determinate rhizomes.

Kentucky bluegrass should be mowed as tall as possible to minimize summer heat stress. Heights of 2.5 to 3 inches should be considered.

This turfgrass is susceptible to disease, particularly summer patch and necrotic ring spot during our warm summers. White grubs can also be a major concern in Kentucky bluegrass lawns and will likely need to be treated.

Kentucky bluegrass has a dark green color and is softer to the touch than tall fescue, making it a popular choice for home lawns. The name "bluegrass" comes from the color of the seedhead. A distinct boat-shaped leaf tip and a very short membrane on the ligule are common to all bluegrasses. (Not seeing the ligule can be considered its identification feature.)

Kentucky bluegrass is often mixed with tall fescue in sun/shade situations and where a mix of heat tolerance and quick recovery is needed (i.e. turf horse tracks). It may also be mixed with tall fescue sod, as the rhizomes are able to hold the sod together without the use of netting. Kentucky bluegrass is available as seed or sod.

Kentucky Bluegrass

Seedhead:	open panicle that strongly resembles the shape of a pine tree (Figure 13)
Vernation:	folded
Ligule:	very short membrane
Auricles:	absent
Leaf blade:	two distinct veins spanning the length of the leaf (Figure 14)
Collar:	somewhat divided
Growth habit:	slender but aggressive determinate rhizomes (Figure 15)

Figure 12. Kentucky bluegrass mowed at lawn height.

Figure 14. The boat-shaped tip of the Kentucky bluegrass leaf.

Figure 13. The pine-tree-shaped seedhead of Kentucky bluegrass.

Figure 15. The aggressive determinate rhizomes of Kentucky bluegrass.

Perennial Ryegrass

Lolium perenne L.

Perennial ryegrass is occasionally used as a lawn grass in Kentucky but more frequently on golf course fairways and athletic fields (Figure 16). It is often confused with Kentucky bluegrass. However, perennial ryegrass does not have the dual mid-rib or boat-shaped tip that is evident on Kentucky bluegrass. Perennial ryegrass is also very shiny looking and will typically have a purple coloration at the base of the stems. Due to the shiny or wet appearance of this species, it stripes very easily when mowing. This grass has excellent wear tolerance but, due to the lack of rhizomes or stolons, has poor recuperative potential. Seed of perennial ryegrass germinates very quickly and so can quickly fill thin areas that would otherwise recover slowly on their own. Because of its striping ability, its wear tolerance, and its germination rate, it can be found on many athletic fields. However, because this grass has a wet look to it, it is rumored to be a more slippery surface for athletes. Perennial ryegrass is the species of choice for winter overseeding of warm-season grasses throughout the southern United States. It will show signs of heat stress in the summer as perennial ryegrass does not possess good heat tolerance. Irrigation must be provided to help this species survive Kentucky's summers. Perennial ryegrass is susceptible to gray leaf spot, brown patch, and pythium. Depending on the summer and the severity of the disease, treatment may be needed. Perennial ryegrass is available by seed only.

Perennial Ryegrass

Seedhead:	a spike with awnless spikelets attached alternately up the stem (Figure 17)
Vernation:	folded
Ligule:	small membranous
Auricles:	very small and somewhat claw-like
Leaf blade:	distinct mid-vein with fine veins across the leaf
Collar:	broad and divided
Growth habit:	bunch type (Figure 18)

Figure 16. Perennial ryegrass mowed at lawn height. Note the shiny appearance of the leaf blades.

Figure 18. The bunch-type growth habit of perennial ryegrass. Note the purple coloration at the base of the stem.

Figure 17. The perennial ryegrass seedhead.

Creeping Bentgrass

Agrostis stolonifera L.

Creeping bentgrass is used on golf course greens, tees, and fairways in Kentucky (Figure 19). It is considered a niche grass for these areas as it has the ability to persist at very low mowing heights. Creeping bentgrass has good heat and cold tolerance, making it a suitable choice for the transition zone climate. However, selection of this species comes with a long list of management needs, making it a poor choice for home owners.

The roots of creeping bentgrass are very shallow, so an adequate irrigation system is required. It is very susceptible to disease and will require several fungicide applications throughout the growing months in Kentucky. It has a stoloniferous growth habit and so has the potential to develop a significant thatch layer (especially if mismanaged). Fertility requirements are high, and mowing must be conducted several times per week (with the use of a reel mower) to maintain height limits.

Creeping bentgrass can be found growing in low lying or wet areas and is often a weed in Kentucky bluegrass lawns. It has fine leaf texture and is very soft to the touch. Traffic tolerance is very poor, but recovery from traffic is good due to the stoloniferous growth habit. The color is bluish green. Creeping bentgrass is available as seed or sod.

Creeping Bentgrass

Seedhead:	compact panicle that typically has a purple coloration (Figure 20)
Vernation:	rolled
Ligule:	tapered or pointed; membranous and quite long for the size of the leaves (Figure 21)
Auricles:	absent
Leaf blade:	leaves are small (narrow), soft to the touch, display prominent veins, and have a pointed leaf tip
Collar:	medium-sized and hourglass shaped (oblique)
Growth habit:	small but aggressive stolons (Figure 22)

Figure 19. Creeping bentgrass mowed to fairway height.

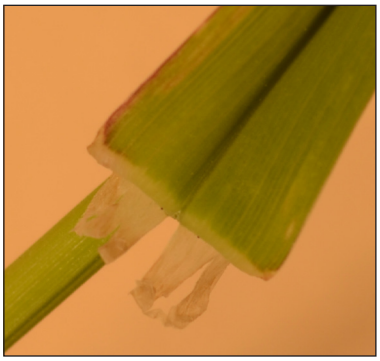


Figure 21. The large membranous ligule of creeping bentgrass.

Figure 20. The creeping bentgrass seedhead.

Figure 22. The stoloniferous growth habit of creeping bentgrass.

Fine-Leaf Fescues

Festuca spp.

Fine-leaf fescue (or fine fescue) is the name of a group of like-featured grasses including: sheeps fescue (*F. ovina* L.); hard fescue [*F. trachyphylla* (Hack.) Krajina]; chewings fescue (*F. rubra* L. ssp. *fallax* Thuill.); and creeping red fescue (*F. rubra* L.). Creeping red and chewings are the primary fine fescues used in the United States (Figure 23).

Fine fescues originated on mountainous areas in Europe and are adapted to well-drained soils, shaded areas, and cold climates. Fine fescues are not recommended for use alone in Kentucky lawns due to summer heat stress and disease concerns. However, they may be used in naturalized areas on golf courses or parks or in sun/shade mixtures with Kentucky bluegrass or perennial ryegrass.

Fine fescues have poor traffic tolerance and poor recuperative capacity and typically do poorly in situations of moderate traffic. These grasses need very little fertility and do not require frequent mowing. Fine fescues are easily identifiable by their needlelike leaves and purple coloration at the base of the stem. Establishment of these grasses is typically by seed, however germination typically takes as long as 14 to 21 days.

Fine-Leaf Fescues

Seedhead:	narrow panicle that does not exhibit the pine tree shape
Vernation:	folded
Ligule:	a very short membrane impossible to see without a hand lens
Auricles:	absent
Leaf blade:	very fine texture and folded in half (needlelike)
Collar:	narrow and continuous
Growth habit:	all are bunch types with the exception of creeping red; very short determinate rhizomes (Figure 24)

Figure 23. Fine fescue mowed at lawn height. Note how this grass tends to lay over or 'lodge' at higher mowing heights.

Figure 24. The fine leaf texture and bunch-type growth habit of fine fescues.

Warm-Season Grasses

Common Bermudagrass

Cynodon dactylon [L.] Pers.

Common bermudagrass is found throughout Kentucky on areas ranging from highway right of ways to home lawns (Figure 25). It grows vigorously and can often be seen spreading into flower beds or across concrete. Because of its growth rate, common bermudagrass is considered a very serious agricultural weed in row crop production. and it is present in many cool-season lawns across Kentucky. Although common bermudagrass may work as a lawn grass in parts of the state, it lacks cold tolerance, thus should be avoided in most situations.

Common bermudagrass also requires frequent mowings and has a higher fertility requirement than other species because of its fast growth rate. It should be mowed at a height range between 0.75 and 2.5 inches. It also lacks shade tolerance, thus it should not be used in areas that do not receive full sunlight.

Common bermudagrass has a fairly coarse texture and lacks density, compared to improved bermudagrass cultivars. The color (unless well fertilized) is usually light green. Improved common types of bermudagrass have been available in the transition zone for several years and are being used with some success. These improved seeded bermudagrasses show improvements in characteristics such as density, color, and cold tolerance. Common bermudagrasses are available primarily from seed.

Common Bermudagrass

Seedhead:	pinwheel arrangement of spicate branches with fingerlike branching of the seedhead; 4 to 6 fingers
Vernation:	folded (difficult to tell)
Ligule:	fringe of hairs
Auricles:	absent
Leaf blade:	hairs on the leaf and no prominent mid-vein
Collar:	narrow, continuous, and may have hairs on sides
Growth habit:	both stolons and rhizomes (Figure 26)

Figure 25. The bermudagrass canopy mowed at fairway height.

Figure 26. The stoloniferous and rhizomatous growth habit of bermudagrass.

Hybrid Bermudagrass

Cynodon dactylon x *C. transvaalensis*
Burtt-Davy

Hybrid bermudagrass (Figure 27) is typically only used on athletic fields and golf courses in the transition zone. It differs from common bermudagrass in that it has finer texture, higher density, and a darker green color. It can be mowed at heights ranging from .125 to 1.5 inches or higher.

Hybrid bermudagrass can only be purchased from sod producers as it does not produce viable seed. Bermudagrasses in general are usually deep rooted, resulting in drought tolerance. Cold tolerance of hybrid bermudagrass varies among cultivar and this characteristic should be a determining factor when selecting this turfgrass.

Hybrid Bermudagrass

Seedhead:	pinwheel arrangement of spicate branches with 2 to 3 fingers as its seedhead
Vernation:	folded (difficult to tell)
Ligule:	fringe of hairs
Auricles:	absent
Leaf blade:	no prominent mid-vein and leaves often have hair; narrower than common bermudagrass
Collar:	narrow, continuous, and may have hairs on sides
Growth habit:	both stolons and rhizomes

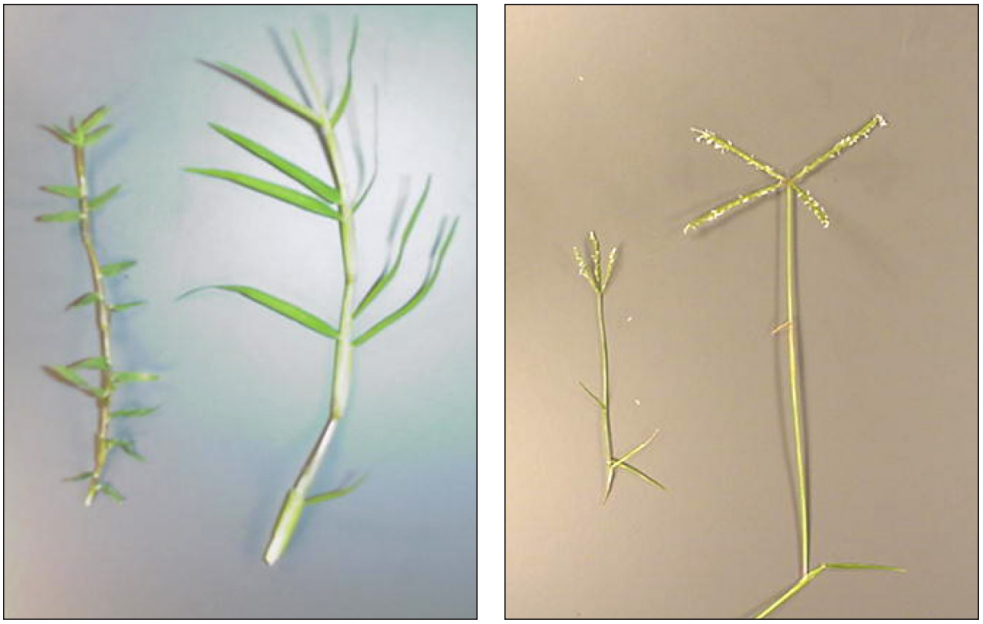


Figure 27. Characteristics of common and hybrid bermudagrass. In both images, the hybrid bermudagrass plant part is on the left.

Zoysiagrass

Zoysia japonica Steud.
Zoysia matrella [L.] Merr.

Zoysiagrass	
Seedhead:	a slender raceme (single spike with seed that seems embedded in the stem)
Vernation:	rolled
Ligule:	fringe of hairs
Auricles:	absent
Leaf blade:	usually small hairs at the base; leaf tip with characteristic steeple shape; youngest leaf tip forms a spearlike point at the end of a stolon and is very sharp to touch
Collar:	broad, continuous, and usually hairy
Growth habit:	both stolons and rhizomes; new shoots produced from nodes on stolons and rhizomes usually grow at a 90-degree angle from the stolon or rhizome

Zoysiagrass can be found on home lawns in the transition zone (Figure 28). It has a much slower growth rate than bermudagrass, which results in less mowing and less creeping into flowerbeds. Because of its slow growth rate, it is unable to recover from damage as quickly as bermudagrass. The leaf blades are much stiffer than bermudagrasses, however, requiring a very sharp mower blade to prevent torn leaf blades. Zoysiagrasses are typically hairier than bermudagrasses. The mowing heights of zoysiagrasses are typically in the range of .75 to 2 inches. Zoysiagrasses also tend to build up thatch (dead leaves, stems, roots, stolons, and rhizomes collecting at the soil surface). If a thatch layer builds up over time, the lawn will feel spongy and there may be a tendency to scalp when mowing. Texture of zoysiagrasses ranges from fairly coarse to very fine. Zoysiagrasses form a very dense canopy that results in a weed-resistant lawn. Zoysiagrasses typically possess excellent cold tolerance and will survive winters as far north as southern Indiana and Illinois. The shade tolerance of zoysiagrass is much superior to bermudagrass so it will tolerate some tree shade. However, the root system is not as extensive as bermudagrass, thus during long dry periods during the summer, it requires irrigation. Zoysiagrasses are available as seed or sod and are usually more expensive than bermudagrass due the length of time it takes a sod producer to reach full cover. If planted from plugs or sprigs it may take as long as one and a half years to completely cover a lawn.

Figure 28. The zoysiagrass canopy mowed at fairway height. Note the excellent density.

Figure 29. The 90-degree and 45-degree growth habit of zoysiagrass and bermudagrass in the upper image. The lower image shows the spear tip at the end of zoysiagrass stolons.

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